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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the point core of the safety shoes using the fiber reinforcement shaping sheet material and it which are manufactured by the manufacturing method of a shaping sheet material, and its method.

[0002]

[Description of the Prior Art]A staple fiber and continuous glass fiber are among the glass fibers used as a fiber reinforced of a synthetic resin molded article, In the case of the mold goods using continuous glass fiber, the mold goods of one-way mat state with which the shape of a random mat which textiles are distributing in the direction scattering in a synthetic resin matrix, the crossing mat state by which continuous glass fiber is woven, or continuous glass fiber is equal to one way are known, respectively. Among mold goods, such as this, since impact strength is weak, the thing of the shape of a random mat of a staple fiber and continuous glass fiber does not satisfy the conditions of JIS demanded as a point core of safety shoes. On the other hand, since the mold goods of the crossing mat state of continuous glass fiber or one-way mat state had bad mobility, there was a problem in a moldability, and since a product may not be made unless it carries out fabricating, even if it fabricates, there was a problem that a manufacturing cost became high.

[0003]For example, the charge made of resin of safety shoes upper core material by which authorization use is carried out at JIS has integral construction with a random layer (skin) for the crossing layer 1 to improve two-layer to the central part, and raise a moldability and mobility on the surface, as shown in the explanatory view of the section of drawing 4.

(i) this shoes upper core -- L class (for light work): -- there are more than pressure intensity-450kg and more than S class (usually operating):pressure intensity-1,100kg. the time of manufacturing the point core made of resin -- case [ of the L class ]: -- although material's own rigidity of the thing of the S class into which needed to use the thing containing 4-8 :crossing layers properly when crossing layers were 2-3 sheets and the S class, and crossing naturally went mostly improves, the insertion nature to a metallic mold worsens, a moldability and mobility are inferior to the L class, and their defective fraction is also high.

[0004](ii) As for the charge of a point core material, since Class S turns into another class respectively and the Class [ L ] number of crossing of S class of a reinforcing layer increases more than L class, naturally, the cost price also becomes high.

(iii) The good polyamide of adhesion with a fiber reinforced is used as a matrix (base material) of material,

There is much fiber-reinforced content as 48 to 54%, if neither polyamide's own absorptivity nor the original fabric of the material with which it is filled up to a metallic mold at the time of shaping is moreover set correctly, in a skin, the balance of a flow will collapse to a core layer, weld will occur in mold goods, and the intensity of a point core will fall. This becomes the unevenness of the intensity of the strength reduction by absorptivity, and mold goods, and appears.

[0005]

[Problem(s) to be Solved by the Invention] This invention tends to provide the point core of the manufacturing method of the shaping sheet material which a product with large intensity can improve a moldability, a shaping sheet material, and the safety shoes using it, when it uses for manufacture of a safety shoes upper core etc.

[0006]

[Means for Solving the Problem] Composition of this invention for solving an aforementioned problem is a point core of a fiber reinforcement shaping sheet material and safety shoes manufactured by claim with a manufacturing method of a shaping sheet material as a statement, and its manufacturing method. Namely, a manufacturing method of a shaping sheet material of this invention, First, collect a cutting piece which cut that with which what wove a pellet or fiber-reinforced material which cut that with which composite molding material containing a fiber reinforced located in a line in the specific direction, for example, fiber-reinforced material arranged with one way, was impregnated in a synthetic resin was impregnated in a synthetic resin, and it is heated, It pressurizes and a shaping sheet material is manufactured.

[0007] Content of fiber-reinforced material of a shaping sheet material manufactured by a described method is 55 - 80wt%. It is required for molecular weights of resin to be 1,000-25,000. It is the thermoplastics chosen from polyamide, polybutylene terephthalate, and a polyphenylene sulfide as the resin, and a thing selected from glass fiber, carbon fiber, an aramid fiber, and a metal fiber is suitable as a fiber reinforced. such [ a point core of safety shoes of this invention ] a fiber reinforcement shaping sheet material -- heating -- pressing is carried out and it produces. If a manufacturing method of a shaping sheet material of this invention is concretely explained with reference to drawing 1, a bunch or a mat of a fiber reinforced arranged with one way will be impregnated with a synthetic resin, and it will be made a rod or a board (drawing 1 a).

[0008] This rod or board is cut in a predetermined size of the range of a predetermined size of 3-50 mm, i.e., length, 1-40 mm in width, and 0.1-10 mm in thickness, and it is made a pellet or a cutting piece (drawing 1 b). In this way, pellets or cutting pieces which were manufactured are collected and it arranges in predetermined thickness (drawing 1 c). It is heated and pressurized and a fiber reinforced considers it as a shaping sheet material located in a line with a random plane direction (drawing 1 d, e). Since this material moreover has much that content, if a fiber reinforced is located in a line with superficial omnidirectional jam random, and it produces a point core of shoes using this, a point core with strong impact strength and pressure intensity will be made.

[0009] The conventional random mat, i.e., material which were mixed with a synthetic resin and distributed a fiber reinforced at random and uniformly, For example, although it can be called the state where a synthetic resin has filled up a place where a pencil equivalent to a fiber reinforced is put in the shape of random in a box, it receives, Since this material can be compared to what became random [-like ] after a gap in the state where a pencil of a fiber reinforced has aligned in one way is filled up with a synthetic resin, there is much content of a fiber reinforced relatively. Therefore, since the mobility of material became insufficient, using a

thing of 10,000-25,000, mobility was maintained and intensity of mold goods was also made large, resin, i.e., a molecular weight, with a small molecular weight. The physical properties of resin itself [ which is carrying out a role like adhesives of a fiber reinforced to a molecular weight being less than 10,000 ] fall, intensity of the whole composite material falls, and if a molecular weight exceeds 25,000, mobility will worsen.

[0010]So that more clearly [ be / content of a fiber reinforced / less than / 55wt% ] than drawing 3, If it becomes difficult to attain in-company reference intensity of 1,500 kg (1,100 kg of JIS standard x safety ratio) of S class point core and 80wt% is exceeded, a resin amount will decrease relatively, and an adhesion effect over a fiber reinforced also decreases simultaneously, Since a composite material's own intensity also falls and a fiber reinforced increases, a moldability also worsens. As a kind of a resin matrix which forms a composite material which consists of this resin and fiber reinforced, and fiber reinforced, the following are mentioned respectively.

[0011]- Resin (base material: matrix)-polyamide (nylon 6, Nylon 66, Nylon 12), Polypropylene (PP), polycarbonate (PC), polybutylene terephthalate (PBT), Thermoplastics, such as a polyphenylene sulfide (PPS) and a polyether ether ketone (PEEK), can be mentioned, among these since it is easy to fabricate viscosity low, nylon 6, polybutylene terephthalate (PBT), and PPS are preferred.

- Kind-glass fiber (GF) of a fiber reinforced, carbon fiber (CF), an aramid fiber, a metal fiber, etc. can be mentioned.

[0012]When heating and pressurizing this composite material and fabricating on a fiber reinforcement sheet, cooking temperature is 210 \*\* - 350 \*\*. At less than 210 \*\*, there are some which melting of resin takes time or are not fused according to a kind of resin, and if it exceeds 350 \*\*, a difference of physical properties will become large for every material by heat deterioration of resin. Pressures that it pressurizes are 10 kg/cm<sup>2</sup> - 80 kg/cm<sup>2</sup>. By less than 10 kg/cm<sup>2</sup>, since a pressure is insufficient, if a void (air bubbles) having contained air occurs and 80 kg/cm<sup>2</sup> is exceeded, a superfluous pressure will be applied to a sheet material, and curvature of a web material and unevenness of HIYORI or board thickness by internal stress happen.

[0013]In this way, when fabricating a point core of safety shoes using a produced shaping sheet material, it is not necessary to use material properly respectively to an object for L class, and S class, and can be used as a common material for L class and S class like before, and a reliable product which was stabilized as for intensity is made. A shaping sheet material whose intensity is much more big can be provided by using a shaping sheet material of this invention for a random layer (skin) of drawing 4, and making a crossing layer (reinforcing layer) further placed between said random layers.

[0014]

[Example]The result of having examined about the point core hereafter produced using the nylon 6 containing glass fiber which is the material which has maximum-spread as a composite material for the point cores of safety shoes is shown. However, the conventional material shown in the following table 1 is a thing of the structure shown in drawing 4, and polyamide resin layer;8ply (layer) having contained the glass fiber of the shape of special textiles is used as the crossing layer 1, The composite material of the nylon 6 containing 45% of random-like continuous glass fiber 2 inches in length is used as the skin 2. this invention material shown in the following table -- glass fiber 25.4 mm in length -- 70wt% -- it is the shaping sheet material produced with the nylon 6 to contain, and the manufacturing conditions are as follows.

[0015]A cut wafer size for web materials; size [ of 10(W) x25.4(L) x0.15 (t, mm) one-way material and a sheet

metallic mold ], die-temperature;150x300x3 (t, mm), 250 \*\*, and sheet forming pressure;25 (kg/cm<sup>2</sup>)  
Cycle time;30 (minute)

[0016]

[Table 1]

先芯の耐圧迫強度比較表（先芯の22mm/mまでの隙間強度）

区分	項目	最 高	最 低	平均 (X)	J I S 基準
L 級	従来材	9 0 0 k g	5 8 0 k g	7 3 0 k g	4 5 0 k g
	本発明材	9 7 7 k g	7 4 0 k g	8 7 0 k g	
S 級	従来材	2,040 k g	1,630 k g	1,930 k g	1,100 k g
	本発明材	2,290 k g	1,970 k g	2,060 k g	

[0017]this invention material has a moldability and good mobility, and its intensity of mold goods is [ passage clear from the result of the above-mentioned table 1 ] stable. If the above-mentioned point core carries out water absorption by perspiration of a leg, etc., resisting pressure Hasama intensity will fall. If water absorption becomes large, intensity will fall. The result is as being shown in drawing 2. water absorption (%) -- each time -- if the intensity of a conventional material and this invention material is measured, there are few pitches, and since the thing of this invention material has many fibers reinforced, intensity is remarkable [ a thing ] as compared with a conventional material. In the point core which used the glass fiber strengthening shaping sheet material, drawing 3 shows the relation between glass fiber content and the intensity (pressure intensity) of a point core.

[0018]Material and its process condition are as follows.

- material: -- sheet forming with a [ glass fiber (25.4 mm in length) / PA6 thickness ] of of 3 mm condition: -- sheet preheating conditions. In a passage clear also from 370 \*\*x 210-second die-temperature compacting pressure [ of 130 \*\* ] 550 kg/cm<sup>2</sup> drawing 3, as compared with the point core of the conventional safety shoes, pressure intensity can build a far strong point core by using the fiber reinforcement shaping sheet of this invention.

[0019]

[Effect of the Invention]As explained above, the fiber reinforcement shaping sheet manufactured by the method of this invention has large intensity, and the moldability is also excellent. Therefore, the point core of the safety shoes produced with this shaping sheet has very large pressure intensity.

[Translation done.]